

200W isolated DC-DC converter
Ultra-wide input and regulated single output



FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 91%
- I/O isolation test voltage 2.25k VDC
- Input under-voltage protection, output short-circuit, over-current, over-voltage, over-temperature protection
- Operating ambient temperature range -40°C to +85°C
- Five-sided metal shielded package
- Industry standard 1/4-Brick package and pin-out
- EN62368 approved

URF48_QB-200W(F/H)R3 series are isolated 200W DC-DC products with 4:1 input voltage. They feature efficiency up to 91%, 2250VDC input to output isolation, operating ambient temperature of -40°C to +85°C, input under-voltage, output short circuit, over-current, over-voltage, over-temperature protection. The products meet CLASS A of CISPR32/EN55032 EMI standards by adding the recommended external components and they are widely used in applications such as battery powered systems, industrial controls, electricity, instrumentation, railway, communication and intelligent robotic.

Selection Guide

Certification	Part No. ^①	Input Voltage (VDC)		Output		Full Load Efficiency(%) Min./Typ.	Capacitive Load (μF) Max.
		Nominal (Range)	Max. ^②	Voltage(VDC)	Current (A)(Max.)		
CE	URF4805QB-200W(F/H)R3	48 (18-75)	80	5	40	86/88	6000
	URF4812QB-200W(F/H)R3			12	16.7	89/91	2000
	URF4815QB-200W(F/H)R3			15	13.3	87/89	2000
	URF4824QB-200W(F/H)R3			24	8.4	89/91	1000
	URF4848QB-200W(F/H)R3			48	4.2	89/91	450
--	URF4836QB-200W(H)R3	48 (18-75)	80	36	5.56	86/88	1000

Note:
① Use "F" suffix is for added aluminum baseplate and "H" suffix for heat sink mounting. We recommended to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
② Exceeding the maximum input voltage may cause permanent damage.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	Nominal input voltage	12V、24V、48V output	--	4579/100	4682/200	mA
		15V output	--	4682/100	4845/200	
		5V、36V output	--	4739/100	4849/200	
Reflected Ripple Current	Nominal input voltage		--	100	--	VDC
Surge Voltage (1sec. max.)			-0.7	--	90	
Start-up Threshold Voltage			--	--	18	
Input Under-voltage Protection			14	16	--	
Input Filter			Pi filter			
Ctrl*	Module on		Ctrl pin open or pulled high (3.5-12VDC)			
	Module off		Ctrl pin pulled low to GND (0-1.2VDC)			

Ctrl*	Input current when off	--	2	10	mA
Hot Plug		Unavailable			

Note: *The Ctrl pin voltage is referenced to input GND.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy			--	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation	5%-100% load		--	±0.5	±0.75	
Transient Recovery Time	25% load step change		--	300	500	μs
Transient Response Deviation	25% load step change	5V output	--	±3	±7.5	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/°C
Ripple & Noise*	20MHz bandwidth	36V output	--	150	300	mVp-p
		Others	--	150	250	
Over-voltage Protection	Input voltage range		110	130	160	%Vo
Over-current Protection			110	130	150	%Io
Short-circuit Protection			Hiccup, continuous, self-recovery			

Note: The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation	Input-output	Electric Strength Test for 1 minute with a leakage current of 5mA max	2250	--	--	VDC
	Input-case		1500	--	--	
	Output-case		500	--	--	
Insulation Resistance	Input-output resistance at 500VDC		100	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	36V output	--	2200	3000	pF
		Others	--	2200	--	
Trim	36V output		100	--	110	%Vo
	Others		90	--	110	
Sense			--	--	105	
Operating Temperature			-40	--	+85	°C
Storage Temperature			-55	--	+125	
Over-temperature Protection	Max. Case Temperature	36V output	95	105	115	
		Others	--	115	120	
Pin Soldering Resistance Temperature	Wave-soldering, 10 seconds		--	--	260	
	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	
Thermal resistance	Free air convection (20LFM)	URF48xxQB-200WR3	--	--	7.5	°C/W
		URF48xxQB-200WFR3	--	--	6.3	
		URF48xxQB-200WHR3	--	--	5.2	
Storage Humidity	Non-condensing		5	--	95	%RH
Vibration			IEC/EN61373 train 1B category			
Switching Frequency	PWM mode		--	250	--	KHz
MTBF	MIL-HDBK-217F@25°C		500	--	--	K hours

Mechanical Specifications

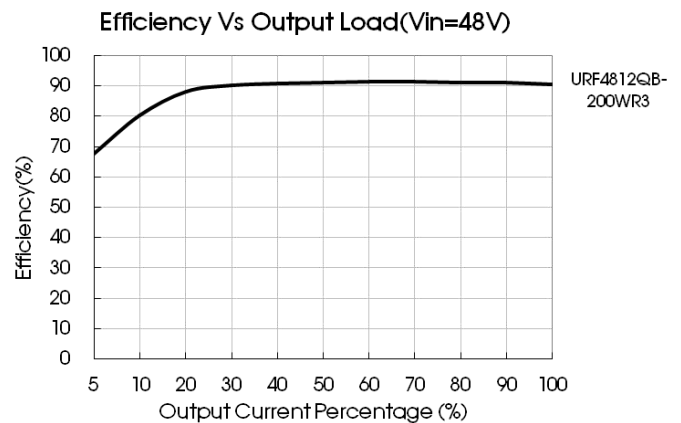
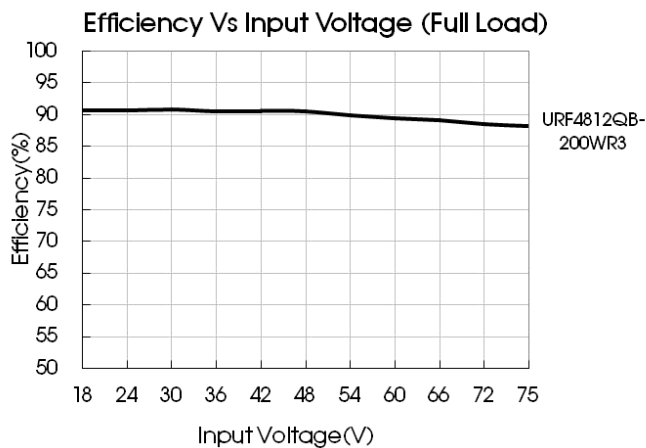
Case Material	Aluminum alloy case, black plastic bottom, flame-retardant and heat-resistant (UL94 V-0)				
Dimensions	URF48xxQB-200WR3		61.8 x 40.2 x 12.7 mm		

Dimensions	URF48xxQB-200WFR3	62.0 x 56.0 x 14.6 mm
	URF48xxQB-200WHR3	61.8 x 40.2 x 27.7 mm
Weight	URF48xxQB-200WR3	89.0g(Typ.)
	URF48xxQB-200WFR3	109.0g(Typ.)
	URF48xxQB-200WHR3	120.0g(Typ.)
Cooling Method	Free air convection (20LFM)	

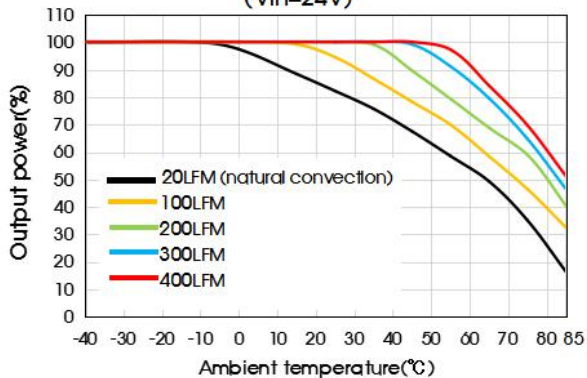
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (see Fig. 2 for recommended circuit)
	RE	CISPR32/EN55032	CLASS A (see Fig. 2 for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2, EN50121-3-2	Contact $\pm 6\text{KV}$ Air $\pm 8\text{KV}$ perf.Criteria B
	RS	IEC/EN61000-4-3, EN50121-3-2	10V/m perf.Criteria A
	EFT	IEC/EN61000-4-4, EN50121-3-2	$\pm 2\text{KV}$ (see Fig. 2 for recommended circuit) perf.Criteria A
	Surge	EN50121-3-2	differential mode $\pm 1\text{KV}$, 1.2/50us, source impedance 42Ω (see Fig.2 for recommended circuit) perf.Criteria B
	CS	IEC/EN61000-4-6, EN50121-3-2	10 V.r.m.s perf.Criteria A

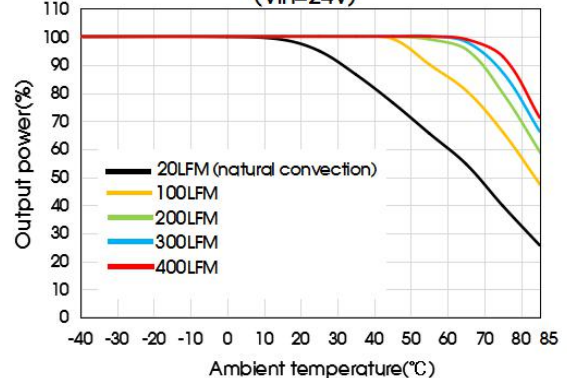
Typical Characteristic Curves



URF4824QB-200WFR3 Temperature Derating Curves (Vin=24V)



URF4824QB-200WHR3 Temperature Derating Curves (Vin=24V)

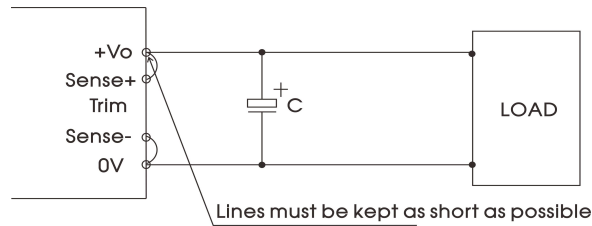


Notes:

1) Product application thermal design should be referred to the recommended PCB layout and recommended heat dissipation structure, please refer to DC-DC Converter Application Notes for specific information.

Remote Sense Application

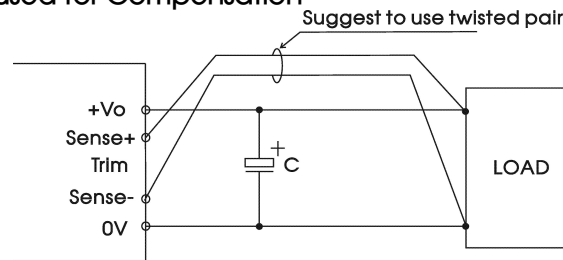
1. Remote Sense Connection if not used



Notes:

- (1) If the sense function is not used for remote regulation the user must connect the +Sense to +Vo and -Sense to 0V at the DC-DC converter pins and will compensate for voltage drop across pins only.
- (2) The connections between Sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and/or causing unstable operation of the power module.

2. Remote Sense Connection used for Compensation



Notes:

- (1) Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used.
- (2) PCB-tracks or cables/wires for Remote Sense must be kept as short as possible. Twisted pair or shielded wire are suggested for remote compensation and must be kept as short as possible.
- (3) We recommended using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.3V and to make sure the power supply's output voltage remains within the specified range.
- (4) Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple. Consult technical support or factory for further advice of sense operation.

Design Reference

1. Typical application

- (1) We recommended using the recommended circuit shown in Fig.1 during product testing and application, otherwise please ensure that at least a 220μF electrolytic capacitors is connected at the input in order to ensure adequate voltage surge suppression and protection.
- (2) We recommended increasing the value of Cin and pay attention to the unstable input voltage if the product input side is paralleled with motor drive circuit and/or larger energy transient circuits, to ensure the stability of input terminal and avoid repeatedly start-up problems due to input voltage lower than under-voltage protection point.
- (3) We recommended increasing the output capacitance with limited to the capacitive load specification and/or increasing the voltage clamping circuit(such as TVS) if the output terminal is inductive device such as relay or a motor, to ensure adequate voltage surge suppression and protection.
- (4) Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.



Fig.1

Vout(VDC)	Fuse	Cin*	Cout	TVS
5	20A, slow blow	220μF	470μF	SMDJ6.0A
12			220μF	SMDJ14A
15				SMDJ17A
24				SMDJ28A
36			100μF	SMDJ47A
48				SMDJ54A

Note:

*Please pay attention to the ambient temperature of the product when using an external capacitor, increase the electrolytic capacitor values to at least 1.5 times the original parameter if the ambient temperature is low.

2. EMC compliance circuit

We recommended using the recommended circuit shown in Fig.2 during product EMC testing and application.

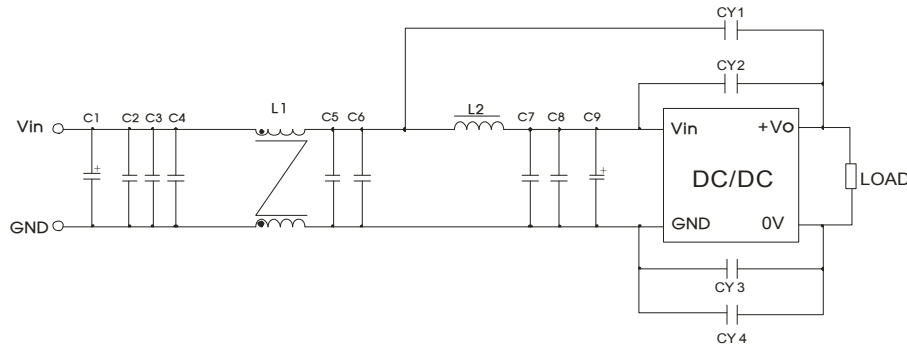
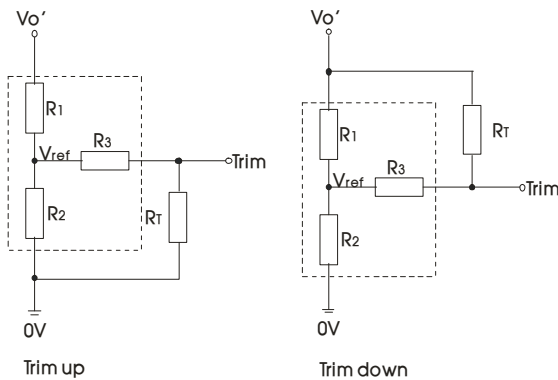


Fig. 2

Components	recommended Component value
C1	150μF/100V electrolytic capacitor
C9	47μF/100V electrolytic capacitor
C2, C3, C4, C5, C6, C7, C8	2.2μF/100V ceramic capacitor
L1	2.0mH, recommended to use MORNSUN P/N: FL2D-A2-202(C)
L2	1.5μH/15A inductance
CY1, CY2, CY3, CY4	1nF Y1 safety capacitor

3. Trim Function for Output Voltage Adjustment (open if unused)



Calculation formula of Trim resistance:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \quad a = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \quad a = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

R_T = Trim Resistor value; a = self-defined parameter
 V_o' = desired output voltage ($\pm 10\%$ max.)

TRIM resistor connection (dashed line shows internal resistor network)

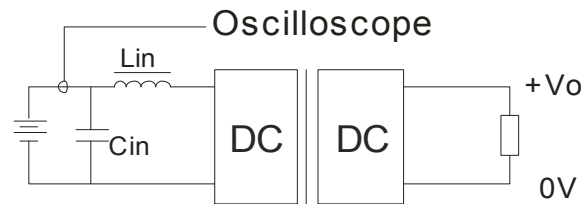
Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
5	3.036	3	10	2.5
12	11.00	2.87	15	2.5
15	14.03	2.8	15	2.5
24	24.872	2.87	15	2.5
36	38.73	2.85	15	2.5
48	53.017	2.913	15	2.5

Note:

(1) When using the Trim down function make sure that the R_T resistor value is calculated correctly. If the Trim pin is shorted with +Vo, or its value is too low, then the output voltage V_o would be lower than $0.9V_o$, which may cause the product to fail;

(2) URF4836QB-200W(H)R3 has no down-regulation function, otherwise it may cause irreparable damage to the product.

4. Reflected ripple current--test circuit

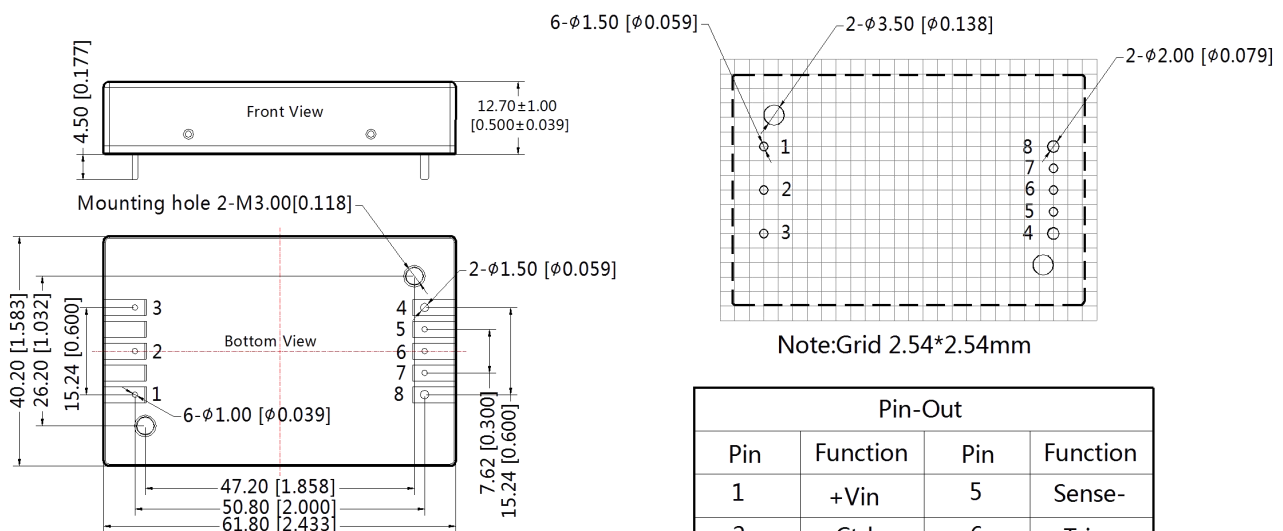


Note: $L_{in}(4.7\mu H)$, $C_{in}(220\mu F, ESR < 1.0\Omega \text{ at } 100\text{ KHz})$

5. The products do not support parallel connection of their output.
6. We recommended the use of a converter with higher output power capability to cover applications with higher power requirements.
7. For additional information please refer to application notes on www.mornsun-power.com

URF48xxQB-200WR3 Dimensions and recommended Layout

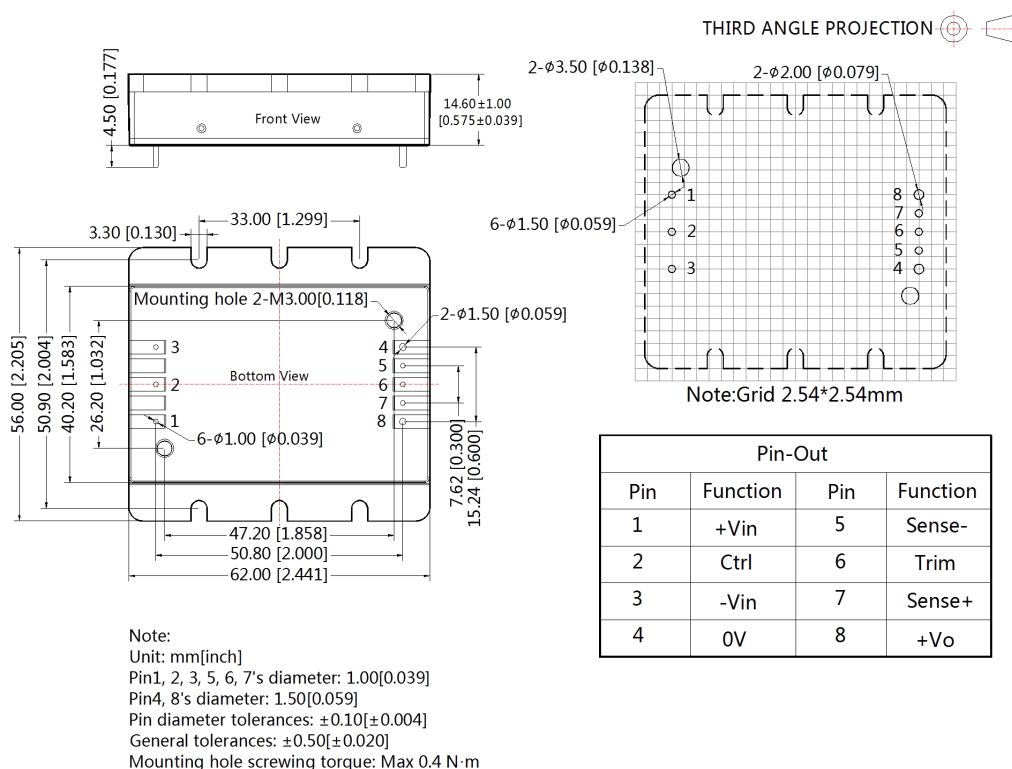
THIRD ANGLE PROJECTION



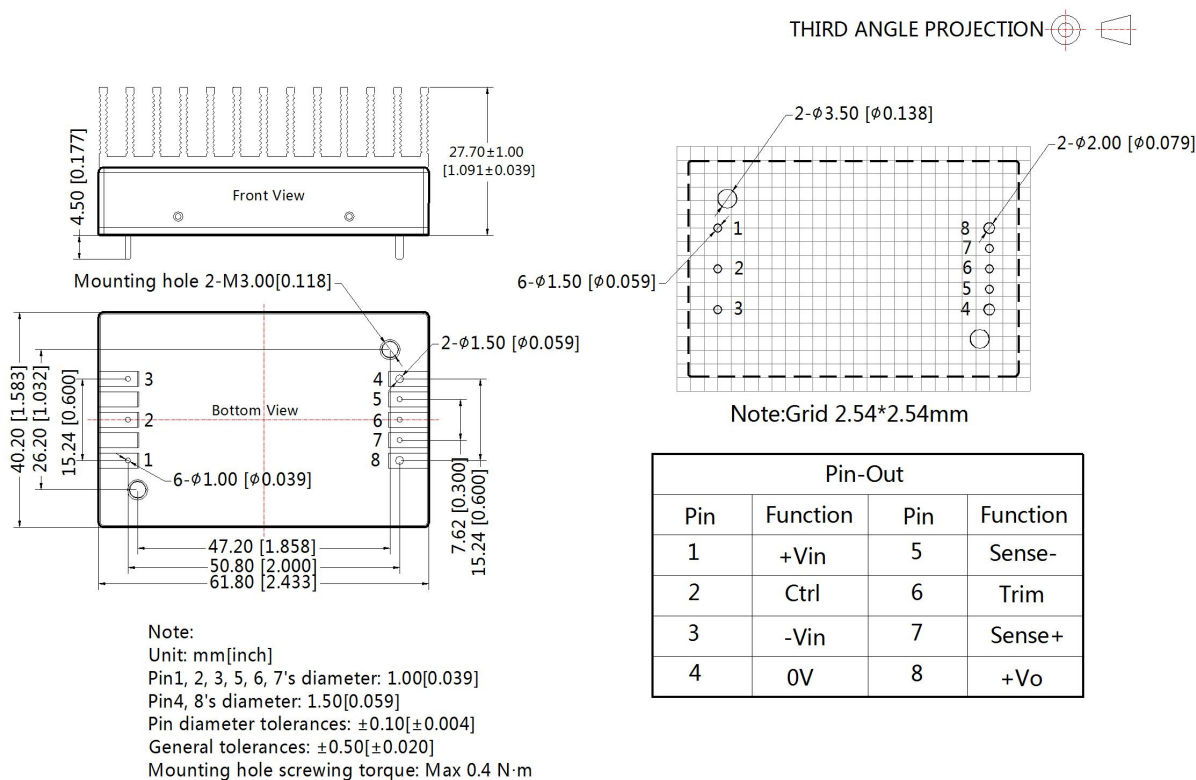
Note:
Unit: mm[inch]
Pin1, 2, 3, 5, 6, 7's diameter: 1.00[0.039]
Pin4, 8's diameter: 1.50[0.059]
Pin diameter tolerances: $\pm 0.10[\pm 0.004]$
General tolerances: $\pm 0.50[\pm 0.020]$
Mounting hole screwing torque: Max 0.4 N·m

Pin-Out			
Pin	Function	Pin	Function
1	+Vin	5	Sense-
2	Ctrl	6	Trim
3	-Vin	7	Sense+
4	0V	8	+Vo

URF48xxQB-200WFR3 Dimensions and recommended Layout



URF48xxQB-200WHR3 Dimensions and recommended Layout



Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number:
58010113(URF48xxQB-200WR3), 58200069(URF48xxQB-200WFR3), 58220017(URF48xxQB-200WHR3);
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, data in this datasheet should be tested under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and rated load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service and match filter module;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Mornsun Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com